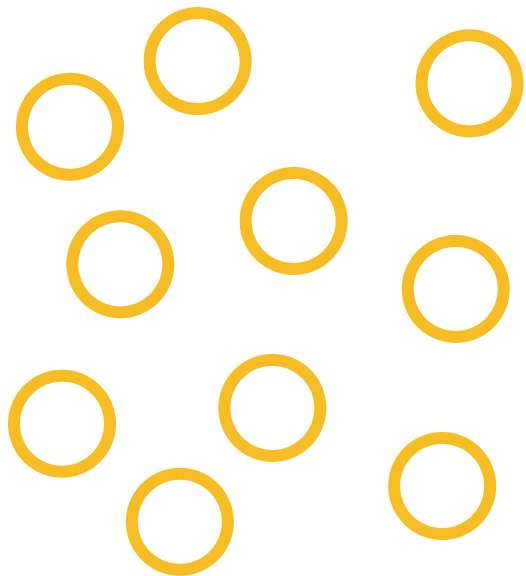


# Unit Testing

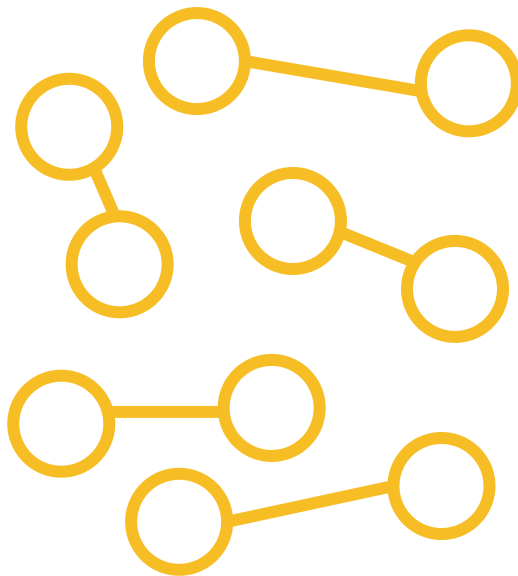


# Testing Level

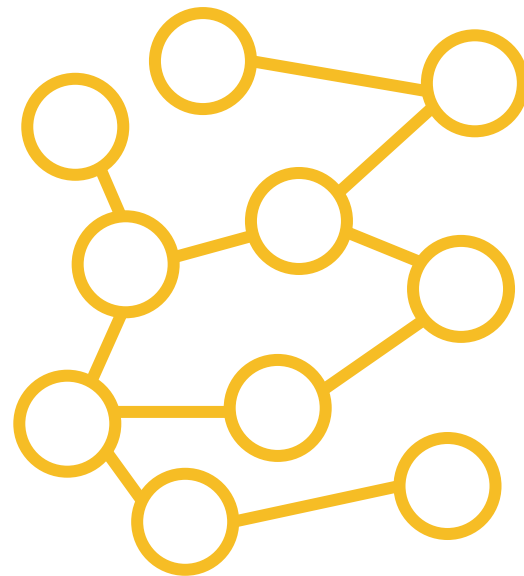
Unit Testing



Integration Testing



System Testing



# Unit Testing

- Tests individual methods
- Improves software correctness
- Automatable and manageable
- Performed by developers
- Often part of continuous testing



# JUnit 4 Framework

- Used for both unit and integration testing
- Built into Eclipse IDE
- Uses custom assertion methods
  - Different from assert statements in Java
- Uses annotations starting in JUnit 4.x
  - @Test, @Before, @After

<http://junit.org/>



# JUnit Assertion Methods

- assertTrue()
- assertNull()
- assertSame()
- assertEquals()
- assertFalse()
- assertNotNull()
- assertNotSame()
- assertEquals()

<https://github.com/junit-team/junit/wiki/Assertions> • <http://junit.org/javadoc/4.8/org/junit/Assert.html>



# JUnit Annotations

- Use `@Before` for code to be called before every test
  - Used to setup environment before test
- Use `@Test` to indicate a method is a unit test
  - Should contain one assertion method
- Use `@After` for code to be called after every test
  - Used to clean up environment after test

<http://junit.org/javadoc/4.8/org/junit/package-summary.html>



# JUnit @Test Annotation

- Able to indicate an exception is expected in a unit test
  - `@Test(expected=IOException.class)`
- Able to indicate a timeout if necessary
  - `@Test(timeout=1000)`
- Using `System.exit()` will break unit tests

<http://junit.org/javadoc/4.8/org/junit/Test.html>



# Advanced JUnit Tests

- Able to create parameterized tests  
<https://github.com/junit-team/junit/wiki/Parameterized-tests>
  - Create single test that expects parameters
  - Create specific list of parameters to test
- Able to create test suites  
<https://github.com/junit-team/junit/wiki/Aggregating-tests-in-suites>
  - Create multiple classes of test cases
  - Group together test cases into test suite

<https://github.com/junit-team/junit/wiki>





# JUnit 4 vs JUnit 5

	JUnit 4	JUnit 5
Architecture	All in one	Three modules (jar files)
Supported Java versions	$\geq$ Java 5	$\geq$ Java 8
Annotations	@Test, @Before, @After, ...	@Test, @BeforeEach, @AfterEach, ...
Assertions	assertTrue, assertNull, assertSame, ...	(same, but more are available)

<https://howtoprogram.xyz/2016/08/10/junit-5-vs-junit-4/>





---

CHANGE THE WORLD FROM HERE